IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	BROWN et al.	)	Examiner:	Lyle Alexander
		)		
Application Number:	10/673,093	)	Group Art Unit:	1797
		)		
Filed:	September 26, 2003	)	Confirmation No.:	7533
		)		
Docket No.:	03073CIP (3600-374-06)	)		

For: METHODS OF SELECTING AND DEVELOPING A PARTICULATE MATERIAL

APPEAL BRIEF
UNDER 37 C.F.R. § 41

Mail Stop **Appeal Brief — Patents**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

(1) Identification

The appellants, application, and the Examiner's identification data associated with this paper are provided in the above-captioned heading.

The appellants hereby file an Appeal Brief under 37 C.F.R. §41.37, together with the applicable fee under 37 C.F.R. §41.20(b)(2), the period for submitting this Appeal Brief having been extended three months from October 10, 2009 to January 11, 2010 by a concurrently filed Petition for Extension of Time under 37 C.F.R. §1.136(a) (January 10, 2010 was a Sunday).

A Notice of Appeal under 37 C.F.R. §41.31 was previously filed with the applicable fee under §41.20(b)(1) on August 10, 2009, the period of response to which had been extended three months from May 10, 2009 to August 10, 2009 by a concurrently filed Petition for Extension of Time under 37 C.F.R. §1.136(a).

(2) Table of Contents

(3) Real Party in Interest

The real party in interest in this case is *Cabot Corporation*, the assignee of record.

(4) Related Appeals and Interferences

The appellants are aware of appeals in U.S. Application Nos. 10/650,124 and 10/649,347, which the Honorable Board may consider to directly affect, be directly affected by, or have a bearing on the Board's decision in the present appeal.

(5) Status of Claims

Claims 6, 8, 12, 30, and 59 are canceled.

Claims 1-5, 7, 9-11, 13-29, 31-34, 56-58, 60, and 135 are rejected.

Claims 35-55 and 61-134 are withdrawn.

Claims 1-5, 7, 9-11, 13-29, 31-34, 56-58, 60, and 135 are on appeal.

(6) Status of Amendments

No amendment was filed subsequent to the Final Office Action dated February 10, 2009.

(7) Summary of Claimed Subject Matter

I. Concise Explanation of the Subject Matter Defined in Independent Claims and Separately Argued Dependent Claims

a) Independent Claim 1

Independent claim 1 is directed to a method of forming a composition comprising a candidate particulate material and a matrix (¶[0009]: page 4, lines 15-17; ¶[0027]: page 11, lines 13-15; page 54, lines 3-5) wherein the method comprises

providing one or more candidate particulate material selected from carbon black or silica for the matrix (¶[0040]: page 17, lines 17-20);

measuring (a) at least one homogenous interaction parameter (¶ [0026]: page 10, lines 14-15, page 10, line 30 to page 11, lines 1-6) for at least one candidate particulate material (¶[0026]: page 10, lines 15-16; ¶[0043]: page 19, lines 7-9; ¶[0071]: page 29, line 8 to page 30, line 5; ¶[0105]: page 45, lines 4-15, 21-25), wherein the homogeneous interaction parameter relates to how the candidate particulate material interacts with itself (¶ [0026]: page 10, lines 14-15), and/or (b) at least one heterogeneous interaction parameter (¶[0026]: page 10, lines 15-16, page 11, lines 6-9) for at least one candidate particulate material and the matrix (¶[0042]: page 18, line 28 to page 19, line 6; ¶[0105]: page 45, lines 4-8, 16-20), wherein the heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other (¶ [0026]: page 10, lines 15-16; ¶ [0079] to ¶ [0084]: page 33, line 27 to page 37, line 9);

adding at least one of the candidate particulate material to the matrix based upon the relationship of (¶ [0041]: page 18, lines 12-20; ¶ [0068]: page 28, lines 10-11; ¶ [0077]: page 33, lines 11-13):

A) at least one performance property of the composition (¶ [0009]: page 4, line 19; (¶

[0027]: page 11, line 17; ¶ [0105]: page 45, lines 26-28; page 54, line 7), and

B) 1) the at least one homogeneous interaction parameter for each candidate particulate material (¶ [0009]: page 4, lines 20-21; ¶ [0026]: page 10, lines 18-26; ¶ [0027]: page 11, lines 18-21; page 54, lines 8-9), or

B) 2) the at least one homogeneous interaction parameter for each candidate particulate material and at least one heterogeneous interaction parameter for each candidate particulate material and the matrix (¶ [0009]: page 4, lines 22-24; ¶ [0026]: page 10, lines 18-26, ¶ [0027]: page 11, lines 22-26; page 54, lines 10-12).

b) Dependent Claim 2

Dependent claim 2, which depends from claim 1, further specifies that the homogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material (¶ [0026]: page 10, lines 27-30; ¶[0043]: page 19, lines 7-14; ¶[0044]: page 19, lines 15-19; ¶[0058]: page 24, lines 23-30; page 54, lines 11-14), wherein the particulate material being measured with respect to physical phenomena that responds to interfacial potential property after effects of morphology have been removed (¶ [0043]: page 19, lines 7-9; ¶[0051]: page 22, lines 6-9).

c) Dependent Claim 3

Dependent claim 3, which depends from claim 2, further specifies that the heterogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial

potential property value, or combinations thereof for the particulate material and for the matrix (¶ [0026]: page 11, lines 6-12; ¶[0043]: page 19, lines 7-14; ¶[0058]: page 24, lines 23-29; page 54, lines 15-18), wherein the particulate material or matrix are measured with respect to physical phenomena that responds to morphology as well as an interfacial potential property of the particulate material or matrix (¶ [0045]: page 19, lines 20-22; ¶[0046]: page 20, line 1 to ¶[0050]: page 22, line 5).

d) Dependent Claim 4

Dependent claim 4, which depends from claim 1, further specifies that the selected candidate particulate material has an interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof which results in a target value for the performance property of the composition (¶[0027]: page 11, lines 26-30; page 54, lines 21-24), wherein the target value is at least one measure of phenomena selected from the group consisting of one or more of interfacial potential by masstone (¶[0059]: page 25, lines 1-9), interfacial potential by gas adsorption techniques (¶[0060]: page 25, lines 10-23), interfacial potential from adsorption from solution (¶[0061]: page 25, line 24 to page 26, line 5), interfacial potential from light scattering or disc centrifuge (¶[0062]: page 26, lines 6-16), interfacial potential by oil absorption (¶[0063]: page 26, lines 17-26), interfacial potential by wicking rates (¶[0065]: page 27, lines 9-22), interfacial potential by rheological tests (¶[0066]: page 27, line 23 to page 28, line 3), interfacial potential by sedimentation volumes (¶[0067]: page 28, lines 4-9), interfacial potential by phase segregations (¶[0068]: page 28, lines 10-14), interfacial potential by inverse gas chromatography (¶[0069]: page 28, lines 15-25), interfacial potential by spreading pressure (¶[0070]: page 28, line 26 to page 29,

line 7), interfacial potential by drop contact angle (¶[0071]: page 29, lines 8-11), interfacial potential by measuring the pressure of gas to remove a probe liquid from the pores of a packed bed of the particulate material after it has been filled or partly filled by the liquid (¶[0071]: page 29, lines 8-9, 12-14), interfacial potential by measuring the centrifugal force necessary to immerse particles of the particulate material floating on a probe liquid (¶[0071]: page 29, lines 8-9, 15-16), interfacial potential by measuring the two-dimensional pressure sufficient to force particles of the particulate material floating on a probe liquid in a Langmuir trough (¶[0071]: page 29, lines 8-9, 17-18), interfacial potential by measuring the relative adsorption of dye probes (¶[0071]: page 29, lines 8-9, 19), interfacial potential by measuring the heat when the particulate material is immersed into a probe liquid (¶[0071]: page 29, lines 8-9, 20-21), interfacial potential by measuring the heat released when a test adsorbate is adsorbed by the particulate material (¶[0071]: page 29, lines 8-9, 22-25), and interfacial potential by measuring the sediment volumes in an homologous series of test liquids (¶[0071]: page 29, lines 8-9, 26-29).

e) Dependent Claim 7

Dependent claim 7, which depends from claim 1, further specifies that the particulate material is carbon black (¶[0040]: page 17, lines 17-19; ¶[0086]: page 37, lines 14-17).

f) Dependent Claim 16

Dependent claim 16, which depends from claim 3, further specifies that the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by a wicking rate method (¶[0027]: page 11, lines 18-26; page 55, line

19 to page 56, line 3), comprising comparing the wicking rate of two or more different liquids in a particulate packed column (¶[0046]: page 20, lines 1-15; ¶[0065]: page 27, lines 9-22).

g) Dependent Claim 25

Dependent claim 25, which depends from claim 1, further specifies that the performance property is conductivity, dispersibility, impact strength, color, reinforcement, powder flow, tribocharging, and rheology (¶[0033]: page 15, lines 11-14; 1-4; ¶[0073]: page 30, lines 21-26; ¶[0101]: page 43, lines 14-28; ¶[0102]: page 43, line 29 to page 44, line 8; page 57, lines 5-7).

h) Dependent Claim 29

Dependent claim 29, which depends from claim 3, further specifies with respect to the heterogeneous interaction parameter, the step of determining the interfacial potential property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof for the matrix (¶[0027]: page 12, lines 1-4; page 57, lines 15-18), wherein the step of determining the interfacial potential property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof for the matrix comprises determining the performance property of a composition comprising the matrix and at least one probe particulate material having a predetermined interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof (¶[0027]: page 12, lines 4-11; ¶[0029]: page 13, lines 1-7; page 57, line 19 to page 58, line 2), and wherein the performance property is selected from the group consisting of

molecular weight, molar volume, dipole moment, relative permittivity, viscosity, density, surface tension, melting point, glass transition temperature, color, and UV absorption (¶[0075]: page 32, lines 5-15).

i) Dependent Claim 31

Dependent claim 31, which depends from claim 3, further specifies with respect to the heterogeneous interaction parameter, that the matrix has a predetermined interfacial potential property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof, as derived from one or more of Hildebrand parameters, hydrogen bonding characteristics, electrostatic factors, fractional polarity, Hansen solubility parameters, Snyder's Polarity index, or solvatochromic parameters (¶[0075]: page 32, lines 12-15; ¶[0105]: page 45, lines 11-15; ¶[0106]: page 45, line 30 to page 46, line 6; ¶[0110]: page 48, lines 13-17).

j) Dependent Claim 32

Dependent claim 32, which depends from claim 3, further specifies the step of determining a surrogate matrix having a predetermined interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof (¶[0028]: page 12, lines 12-19; page 58, lines 6-9), wherein the surrogate matrix comprises a chemically related formulation of a customer's exact formulation (¶[0081]: page 35, lines 3-13; ¶[0082]: page 35, lines 14-18).

k) Dependent Claim 33

Dependent claim 33, which depends from claim 32, further specifies that the method further comprises the step of selecting the candidate particulate material based on a predetermined relationship between (¶[0010]: page 5, lines 4-5; ¶[0028]: page 12, lines 17-19; page 58, lines 10-11):

A) at least one performance property of a composition comprising the surrogate matrix and the particulate material ((¶[0010]: page 5, lines 8-9; ¶[0028]: page 12, lines 20-21; page 58, lines 12-13), and

B) a combination (¶[0012]: page 6, lines 3-4; ¶[0026]: page 11, lines 9-12; ¶[0028]: page 12, line 22; page 58, line 14) of

i) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material (¶[0028]: page 12, lines 23-25; page 58, lines 15-17) and

ii) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the surrogate matrix (¶[0028]: page 12, lines 26-30; page 58, lines 18-20).

l) Independent Claim 56

Independent claim 56 is directed to a method of forming a composition comprising a candidate particulate material and a matrix ((¶[0009]: page 4, lines 15-17; ¶[0027]: page 11, lines 13-15; page 62, lines 20-21), wherein the method comprises providing one or more candidate

particulate material selected from carbon black or silica for the matrix and determining a relationship by (¶[0040]: page 17, lines 17-20; page 62, lines 21-22):

A) measuring at least one performance property of the composition (¶[0009]: page 4, line 19; ¶[0027]: page 11, line 17) and

B) measuring 1) at least one homogeneous interaction parameter for the particulate material (¶[0009]: page 4, lines 20-21; ¶[0027]: page 11, lines 18-21; page 62, line 24 to page 63, line 1), wherein the homogeneous interaction parameter relates to how the particulate material interacts with itself (¶ [0026]: page 10, lines 18-26), or

B) 2) at least one homogeneous interaction parameter for the particulate material and at least one heterogeneous interaction parameter for the particulate material and the matrix (¶ [0009]: page 4, lines 22-24; ¶ [0027]: page 11, lines 18-26; page 63, lines 2-4), wherein the heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other (¶ [0026]: page 10, lines 18-26),

adding at least one of the candidate particulate material to the matrix based upon the relationship (¶[0014]: page 6, lines 16-25; ¶ [0079] to ¶ [0084]: page 33, line 27 to page 37, line 9), wherein the selected candidate matrix has an interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof which results in a target value for the performance property of the composition (¶[0027]: page 11, lines 26-30; page 54, lines 21-24; page 63, lines 13-16).

(8) Grounds of Rejection to be Reviewed on Appeal

1) Whether claims 1-5, 7, 9-11, 13-29, 31-34, 56-58, 60, and 135 are unpatentable on the ground of non-statutory obviousness-type double patenting over claims 1-66 of co-pending U.S. Patent Application No. 10/650,124 and claims 1-43 of co-pending U.S. Patent Application No. 10/649,347.

2) Whether claims 1-5, 9-11, 13-29, 31-34, 56-58, 60, and 135 are unpatentable under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,482,883 to Cuch et al.

3) Whether claim 7 is unpatentable under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,482,883 to Cuch et al. in view of U.S. Patent No. 7,021,213 to Sampei.

(9) Argument

1. Provisional Rejection Of Claims 1-5, 7, 9-11, 13-29, 31-34, 56-58, 60, and 135 Based On Non-statutory Obviousness-type Double Patenting.

Claim 1

Claims 1-5, 7, 9-11, 13-29, 31-34, 56-58, 60, and 135 were provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1-66 and claims 1-43 of co-pending U.S. Patent Application No. 10/650,124 and U.S. Patent Application No. 10/649,347, respectively.

The Examiner's Position

According to the Final Office Action dated February 10, 2009 (page 2), although the conflicting claims are not identical, they are not patentably distinct from each other because all of the claims are directed to methods of selecting a particulate material based upon the properties of the particle.

The Appellants' Position

In response to this provisional rejection as initially made in the Examiner's Office Action of August 6, 2008, a Terminal Disclaimer in compliance with 37 C.F.R. § 1.321 was submitted by the appellants' on December 5, 2008 in the instant application relative to commonly owned U.S. Patent Application No. 10/650,124 and U.S. Patent Application No. 10/649,347, with payment of the applicable fee.

As clearly shown in US PTO PAIR records, the appellants' indicated Terminal Disclaimer submitted December 5, 2008 was <u>approved</u> by the US PTO on December 8, 2008.

The Examiner's maintenance of this provisional rejection in the Final Office Action, despite the appellants' previous submission of a Terminal Disclaimer to overcome this rejection, which US

PTO records show has been approved, is clearly improper.

In view of the above reasons, this rejection should be reversed.

2. Rejection Of Claims 1-5, 9-11, 13-29, 31-34, 56-58, 60, and 135 under 35 U.S.C. §102(b) as anticipated by Cuch et al. (U.S. Patent No. 6,482,883).

Claim 1

Claims 1-5, 9-11, 13-29, 31-34, 56-58, 60, and 135 were finally rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,482,883 to Cuch et al.

The Examiner's Position

According to the Final Office Action dated February 10, 2009 (pages 2-3), the Examiner considers present independent claim 1 (and claim 56) to state that the performance property could be either "homogeneous interaction ..." or "heterogeneous interaction ...". The Examiner states that for purposes of examination, the Office will consider the "homogeneous interaction" alternative. The Examiner further states that in light of the appellants' May 9, 2008 election of species electing "interfacial potential by wicking rates" that the Office interprets the "homogeneous interfacial parameters" as a "wicking rate." The Examiner states that Cuch et al. teaches an ink jet coating composition comprising a pigment of blended silicas, including fumed silica (citing column 3, lines 51-56), read on the claimed "particulate material", and a blend of polyvinyl alcohol and a cationic resin read on the claimed "matrix." The Examiner further states that Cuch et al. teaches testing the ink composition's image density by the "Black Wicking rating" or BWR (citing "Columns 9-10, lines 18+"), and that the BWR testing has been read by the Examiner on the claimed "homogeneous interaction parameter ... relates to how the particulate material interacts with itself ...". At page 5 of the Final Office Action, the Examiner further states, *inter alia*, Cuch et al. teaches silica in the ink composition and that the "... the taught analysis of the ink composition inherently includes

the analysis of the silica", and that the claims are "sufficiently broad" to have been read on Cuch et al. and do not exclude the addition compounds in the ink composition of Cuch et al. The Examiner also states that the instant claim language requires measuring the interaction of the particle with itself and "a matrix which has been properly read on the taught interaction of the ink with the paper (e.g., read on the claimed matrix)."

The Appellants' Position

The present invention, as explained in the present application, is directed at least in part to a method which allows one to select a candidate particulate material for a composition and preferably provide improved or optimized performance properties in the composition (see, e.g., ¶[0025]: page 10, lines 3-5). The present invention can make use of the interfacial potential of the particulate material either alone or in combination with the interfacial potential of the matrix in which the particulate material is used. As discussed and illustrated in the present application, the present invention includes the use of at least one homogeneous interaction parameter for the particulate material (for example, the work of cohesion of a particulate material) and/or at least one heterogeneous interaction parameter for the particulate material and the matrix (for example, the work of cohesion and the work of adhesion)(see, e.g., ¶[0025]: page 10, lines 5-13). As defined in the present application and recited in claim 1 on appeal, a "homogeneous interaction parameter" relates to how the particulate material interacts with itself, and a "heterogeneous interaction parameter" relates to how the particulate material and the matrix interact with each other (e.g., ¶[0026]: page 10, lines 14-16).

In the past, the means for selecting a particulate material for use in a composition to achieve a desired performance was based on <u>only</u> the morphology of the particulate material and/or the chemistry of the particulate material. Even knowing these parameters, selecting a

particulate material for incorporation in a composition to achieve a desired performance still resulted in unpredictability and involved a certain amount of guess work. Until now, the industry was not entirely clear why the product would not perform consistently even though it was within morphological specifications. As also explained in the present application, the present invention now makes it possible to select particulate materials based on at least one homogeneous interaction parameter for the particulate material and/or based on at least one heterogeneous interaction parameter for the particulate material and the matrix, which enables a customer to more readily achieve the desired performance of their product (e.g., ¶[0037]: page 16, line 24 to page 17, line 4). In this way, the customer is provided with a product that should perform consistently and optimally in their end product. The present invention also provides a way to better select types, grades, and/or brands of particulate material. This system permits the manufacturers and customers to better select types, grades, and/or brands of particulate materials and permits those in the industry to select more accurately the types, grades, and/or brands of particulate materials.

The concept of "interfacial potential" as used in the present invention is illustrated in the examples and figures of the present application. Several of these illustrations are discussed below in summary fashion to assist the Honorable Board's understanding of the present claims on appeal, which include this terminology or terms, such as "homogeneous interaction parameter" or "heterogeneous interaction parameter," which can comprise interfacial potential property values. In this illustrative discussion of "interfacial potential," several of the selected tables from the present application, some of which are annotated to assist the discussion, and figures, are included in the Evidence Appendix section of this Appeal Brief. For instance, Table 3 (Example 2: ¶[0091]: page 40, lines 1-8) shows volume at maximum torque data taken on the same grade of carbon black from four manufacturing plants (↑31) as measured using three different liquids (↑33, ↑34,

↑35). The terminology "same grade of carbon black" means the carbon blacks share compliance with a specified measure of morphology, such as "% of max DBP" (↑32) at volume of maximum torque in this example. As the data in Table 3 shows, the results in volumes for "% of max DBP" (↑32) are closely clustered, but those obtained for the other liquids (↑33, ↑34, ↑35) are not the same from manufacturing plant to manufacturing plant. This means that the interfacial potentials are not the same for the four samples and hence the products are not the same, even though they were supposed to be uniform based on at least one morphological criterion.

The cited art, such as Cuch et al., show no appreciation for this phenomenon and problem, which has been discovered and solved by the present inventors-appellants. Thus, the products would be better specified if at least one of these interfacial potential property values were included. Table 4 (Example 3: ¶[0093]: page 40, lines 23-29) shows data for a similar test as done for Example 2 (Table 3) except with a higher DBP specification carbon black (↑41), wherein the results show the volumes for "% of max DBP" (↑42) are closely clustered, but those obtained for the other liquids (↑43, ↑44, ↑45) are not the same from manufacturing plant to manufacturing plant. The data in Table 4 also shows that the products would be better specified if at least one of these interfacial potential property values were included. The data shown in Table 5 (Example 4: ¶[0095]: page 41, lines 16-29) includes upper rows (↓51), which shows that by the standard QA/QC values, the listed carbon blacks are all the same by the standard specification. However, when the interfacial potentials are measured by the rate of wicking of various liquids up a packed powder bed, as shown in lower rows (↑52), they differ by their interfacial potentials. A method of the present invention, which comprises assigning at least one interfacial potential property value, would be able to distinguish between them. For example, referring to Figure 3 (Example 5: ¶[0102]: page 43, line 29 to page 44, line 5), this figure illustrates the utility of using interfacial

potential values to select a carbon black for a given application. The predetermined relationship represented in Figure 3 for high-density polyethylene (HDPE) allows selection of a carbon black based on its interfacial properties to achieve desired impact strength. The relationship in Figure 3, for example, indicates that a carbon black particle must have a high Wc-Wa (work of cohesion - work of adhesion) value to achieve impact strength at 25kJ/m2 at low carbon loadings at approximately 5 percent. These types of plots indicate how particular the interfacial properties of the carbon black allow different loadings in the composite systems with out compromising the impact properties. Referring to Table 10 (Example 8: ¶[0109]: page 48, lines 1-11), interfacial potential values based on the Hansen Solubility Parameter Scale were determined for carbon blacks used in plastic compositions. Hansen solubility parameters are used in the plastics industry to predict the compatibility of plastics with each other and their solubilities in various solvents. Table 10 shows a set of interfacial potential values corresponding to the Hansen Solubility Scale for each carbon black that were found by a least squares fit of the measured works of adhesion and the known solubility parameters for the liquids. The interfacial potential values for each powder has three components S^d, S^p, and S^H. Referring to Table 11: ¶([0112]: page 49, lines 11-21), interfacial potential values based on Hildebrand Parameters were also determined for commercial carbon blacks used in plastic formulations. Hildebrand parameters are also commonly used in the plastics industry to predict the compatibility of plastics with each other and their solubilities in various solvents. Table 11 shows the interfacial potential values corresponding to the Hildebrand Parameter Scale for each carbon black that were found by a least squares fit of the measured works of adhesion and the known Hildebrand parameters for the liquids, wherein the interfacial potential value for each powder has one component (δ_p). Table 12 (Example 10: ¶[0114]: page 50, lines 8-18) shows interfacial potential values S^1, S^2, and S^3 determined based on an Ab Initio Scale,

wherein the work of adhesion can also be based on an independent set of parameters for the liquid as well as the powder. Table 15 (Example 11: ¶[0117]: page 52, lines 8-14) shows the results of an example of how a process variable (viz., furnace reactor quench length) can be adjusted to produce carbon blacks with similar morphological values but different interfacial potential property values. Table 15 shows both the morphological values (surface area and structure) as well as the interfacial potential property values (wicking rates of two liquids – ethylene glycol and bromonaphthalene, gm^2/sec) for each carbon black. Also included is the ratio of the two measured wicking rates. As can be seen in the data of Table 15, both the nitrogen surface area and the DBPA values for the three carbon blacks were very similar. Thus, using only these measures, the three carbon blacks would be considered the same or about the same. However, using measures of interfacial potential, such as the ethylene glycol and bromonaphthalene wicking rates and/or wicking rate ratios, it is clear that these carbon blacks are quite different. The effect of quench length on the ratio of wicking rates shown in Table 15 is shown in Figure 5. This figure demonstrates a relationship between the process variable and interfacial potential property values. Table 16 (Example 12: ¶[0117]: page 52, lines 8-14) shows the relationship between interfacial potential property values as measured by absorptometry and scorch for rubber compositions comprising a rubber and carbon black. The results in Table 16 show that, while the tested carbon blacks are very similar based on their morphological values, such as Iodine number, DBP, BET, and STSA, they are significantly different based on measures of interfacial potential, such as maximum torque volume at maximum torque. The data is also shown in Figure 6 which shows the scorch values versus the maximum torque and volume at maximum torque. Other Examples and figures of the present application further illustrate the "interfacial potential" concept identification and recognition, and its use in methods for performance property control and assurance.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Cuch et al. does not identically disclose, nor suggest or predict the outcome of, the claimed invention.

Cuch et al. relates to an ink jet coating composition comprising a blend of silicas, a blend of super and/or fully and partially hydrolyzed polyvinyl alcohols, and a cationic resin (see, e.g., the Abstract). The blend of silicas used in the ink jet coating composition preferably includes first and second quantities of silica particles that have different pore volumes and the same or different average particle sizes (column 2, line 65 to column 3, line 17; column 3, lines 33-50; column 4, lines 7-16). As explained in the present application, particle porosity and particle size are conventional morphological properties used to specify particulate materials (see, e.g., ¶[0004]: page 3, lines 3-7; ¶[0045]: page 19, lines 20-31). They are not a homogeneous interaction parameter (nor a heterogeneous interaction parameter) as defined in the present application and recited in claim 1 on appeal.

The Examiner states that "Cuch teaches silica in the ink composition" and teaches testing the "ink composition's image density" (Final Office Action, pages 5, 3). However, Cuch et al. is <u>not</u> directed to an ink composition containing silicas that is printed on a surface of a paper. Cuch et al. relates to an ink jet coating composition containing silica particles or silicas that is *precoated on a paper*. The coated paper, i.e., the paper coated with the ink jet coating composition, can receive printing ink. As explained at column 9, lines 27-29 of Cuch et al., for instance, black text ink can be received on a "white background" of a paper. This "white background" is understood to comprise the precoating of the ink jet coating composition containing silicas. Therefore, the Examiner's use of terminology of "ink composition's image density" (Final Office Action, page 3) and "ink

composition" (Final Office Action, page 5) when possibly referring to the "ink jet coating composition" of Cuch et al. is confusing without this distinction kept in mind between printing ink and Cuch et al.'s ink jet coating composition containing silicas that is coated onto paper. As properly understood, Cuch et al. does not teach or suggest at least the "measuring" or "adding" recitations of claim 1 on appeal.

Present claim 1 on appeal has several alternatives for the *measuring* recitation. In this respect, claim 1 recites *measuring (a)* at least one homogenous interaction parameter for at least one candidate particulate material, wherein said homogeneous interaction parameter relates to how the candidate particulate material interacts with itself, *and/or (b)* at least one heterogeneous interaction parameter for at least one candidate particulate material and the matrix, wherein said heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other. Neither of these measuring recitations (a) or (b) in claim 1 on appeal are taught or suggested by Cuch et al. in view of the following reasons.

Claim 1 "measuring (a)" recitation.

Cuch et al. does not teach or suggest the indicated measuring alternative (a) recited in claim 1 on appeal (i.e., the measuring of at least one homogenous interaction parameter that relates to how the candidate particulate material interacts with itself). The Examiner relies on the "Black Wicking Rating" or "BWR testing" described in Cuch et al., primarily at columns 9 and 10 (Final Office Action, page 3). However, a closer examination of the sections of Cuch et al. related to the black wicking rating clearly relate to a wicking rating test that does not measure at least one homogeneous interaction parameter for the <u>particulate material</u> alone. The black wicking rating described at columns 9 and 10 of Cuch et al. and relied upon by the Examiner to finally reject the claims only relates to a printing performance test of the <u>overall</u> coating composition and did not determine or take

into consideration the interaction between the silica and how the silica interacts with itself. The Examiner alleged that the black wicking rating reads on the claimed "homogenous interaction parameter . . . relates to how the particulate material interacts with itself . . . ". However, this is not accurate. A closer examination of the details of the black wicking rating of Cuch et al. than described in the Final Office Action shows this inaccuracy.

As related at column 9, lines 30-49 of Cuch et al., the black wicking rating is essentially determined by a procedure of printing identical black lines 0.2 mm apart on a sample of ink jet recording material (i.e., coated paper) using a white background on a prescribed printer; magnifying the image between adjacent lines 68 times ("68x"); photographing the magnified image; cutting out the area between the adjacent lines and weighing the cut portion; dividing the weight in grams (g) of the cut portion by the basis weight in grams per square millimeter (g/mm^2) of the photographic paper to calculate out average distance between lines (ADBL) in millimeters (mm); and then calculating BWR using the previously calculated ADBL average distance value with the BWR calculation equation that is shown. The BWR calculation equation of Cuch et al. essentially correlates spacing between adjacent printed lines printed on the ink jet recording material with wicking rate, characterized as the black wicking rating. However, this black wicking rating determination procedure of Cuch et al. is not designed or conducted to measure at least one homogeneous interaction parameter of a silica *per se* of the ink jet coating composition where the interaction parameter relates to how the silica interacts *with itself*. The Examiner has not identified or explained which aspects of this black wicking rating determination procedure of Cuch et al. are believed to provide that information on a silica candidate for the ink jet coating composition. The appellants do not see any relevance to claim 1 on appeal.

Further, the ink jet coating composition of Cuch et al. contains silicas mixed with at least a binder and cationic resin, and this mixture has been coated on paper and dried in order "to form an ink receptive layer on the substrate surface" for any black wicking rating evaluation (column 6, lines 49-53). In view of this state of the silica components of the ink receptive layer on the paper surface, there is no apparent technical or scientific reason to consider the black wicking rating of Cuch et al. to yield a measure of at least one homogeneous interaction parameter of a silica *per se* of the ink receptive layer on the paper.

As indicated, claim 1 on appeal recites, as one of the measuring options, measuring at least one homogeneous interaction parameter for the candidate material itself and how that particulate material interacts with itself and, clearly, the black wicking rating of Cuch et al., described at columns 9 and 10, is a wicking rating for the *overall coating material* that contains all of the components and there is no measurement or understanding of the silica and how that silica interacts by itself with respect to wicking. Essentially, the black wicking rating of Cuch et al. relates to a performance property of the ink jet recording material as opposed to a homogenous interaction parameter of any particulate component of the ink receptive layer on the paper, and simply identifies how well an image can be printed on a piece of paper without wicking. This has nothing to do with understanding a candidate particulate material and measuring a homogeneous interaction parameter of the particulate material.

The Examiner's suggestion in the Final Office Action (page 5) that "Cuch teaches silica in the ink composition and the taught analysis of the ink composition inherently includes the analysis of the silica" is an allegation lacking any evidentiary support from the Cuch et al. reference itself, nor has the Examiner provided scientific reasoning to establish the reasonableness of the Examiner's belief that "the ink composition [of Cuch et al.] inherently includes the analysis of the silica."

As explained in the Honorable Board's precedential opinion in Ex parte Whalen, Appeal No. 2007-4423 (decided July 23, 2008):

> "Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient." *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981). *See also Ex parte Skinner*, 2 USPQ2d 1788, 1789 (BPAI 1986) ("[T]he examiner must provide some evidence or scientific reasoning to establish the reasonableness of the examiner's belief that the functional limitation is an inherent characteristic of the prior art" before the burden is shifted to the applicant to disprove the inherency.).

The Examiner's above-indicated belief that "the ink composition [of Cuch et al.] inherently includes the analysis of the silica" appears to be based on a mere probability or possibility without any evidence that it does occur or can be expected to occur with certainty. The Examiner has not provided evidence or scientific reasoning to establish the reasonableness of the Examiner's belief that any specific method for analyzing the product performance in Cuch et al., such as the black wicking rating (BWR) shown in column 9 thereof, reads on the claim 1 recitation of "measuring (a) at least one homogeneous interaction parameter ... [that] relates to how the candidate particulate material interacts with itself ...".

Furthermore, no section of Cuch et al. describes a method of forming a composition with a particulate material and matrix by first providing a candidate particulate material and measuring the homogenous interaction parameter, *and* also taking into account, as further recited in claim 1 on appeal, the *relationship* of a performance property of the composition *and* at least one homogeneous interaction parameter for the particulate material.

Therefore, the Examiner has not made out a case of express or inherent anticipation by Cuch et al. in respect to measuring alternative (a) encompassed by claim 1 on appeal.

Claim 1 "measuring ... (b)" recitation.

Cuch et al. also does not teach or suggest the alternative or additional measuring recitation (b) to measuring recitation (a) recited in claim 1 on appeal. This measuring alternative of the claim is recited as: "...(b) measuring at least one heterogeneous interaction parameter for at least one candidate particulate material and the matrix, wherein said heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other." As indicated, the black wicking rating described at columns 9 and 10 of Cuch et al. only relates to a printing performance test of the overall ink jet coating composition component of the ink jet recording material (i.e., the coated paper)(see, e.g., column 9, lines 28-53). The black wicking rating of Cuch et al. does not measure a heterogeneous interaction parameter that relates to how a particulate material, such as the silica, and a matrix (e.g., the binder or the paper according to the Examiner) interact with each other. The black wicking rate of Cuch et al. shows how printing ink interacts with the coated paper, but not any individual constituents (such as silica) of the ink jet coating composition or the paper surface coated with that composition. As indicated, the black wicking rate shows the performance of the ink jet coating composition as coated and dried on paper and how black ink migrates on the coating.

This lack of teaching in Cuch et al. of the measuring recitation (b) of claim 1 on appeal is also shown by the examples of Cuch et al. (column 12, line 1 to column 14, line 64; Table 1). In the examples of Cuch et al., black wicking rating (BWR) and other performance properties of coated paper samples were measured where the aqueous coating composition was varied using different combinations of silicas and binders. Cuch et al. concluded from these examples that a blend of silicas with pore volumes and particle sizes within stated ranges were needed to achieved desired performance properties (column 13, line 66 to column 14, line 55). From these examples,

Cuch et al. essentially relates to conducting quality control or assurance with reference to only the product end of production, without measuring a heterogeneous interaction parameter related to how a candidate particulate material and a matrix interact with each other.

Therefore, the Examiner has not made out a case of express or inherent anticipation by Cuch et al. in respect to measuring alternative (b) encompassed by claim 1 on appeal.

As explained in the present application, quality control efforts in the use of some particulate material-containing compositions in matrices or compositions as conducted at the product end of production is problematic. The present method can allow the proper or optimal selection of particulate materials prior to formulation for a matrix or composition, which can permit an improved or optimized performance in an application. Certainly, no section of Cuch et al. describes a method of forming a composition with a particulate material and matrix by first providing a candidate particulate material and measuring a homogeneous interaction parameter for the candidate particulate material and/or a heterogeneous interaction parameter for the particulate material and the matrix.

Claim 1 "matrix" recitation.

The Examiner appears to inconsistently "read" the paper of Cuch et al. on the claimed matrix for purposes of the Examiner's anticipation rejection (Final Office Action, page 5), while elsewhere stating that the polyvinyl alcohol/cationic resin of Cuch et al. is "read" on the claimed matrix for purposes of this anticipation rejection (Final Office Action, page 3). With respect to the Examiner's apparent alternate readings of the paper or binder of Cuch et al. as representing the "matrix" of the present claims, the Examiner's reasoning is flawed in either case. As indicated, "the ink" in Cuch et al. that is used as printing ink for the black wicking rating determination discussed in columns 9-10 thereof is not the ink jet coating composition that contains the silicas

that has been preapplied to the paper. On the other hand, and as indicated, the black wicking rating of Cuch et al. relates to a performance property as opposed to a homogeneous interaction parameter or a heterogeneous interaction parameter (as defined in the present application) for the silica that can be used in the ink jet coating composition associated with the paper. Therefore, the Examiner's attempt to read either the binder or paper of Cuch et al. on the present claimed "matrix" does not overcome the fact that Cuch et al. does not provide a measurement of a homogeneous interaction parameter for a candidate particulate material itself or a heterogeneous interaction parameter for the candidate particulate material and the matrix.

Claim 1 "adding" recitation.

As indicated, claim 1 on appeal also recites *adding* at least one of the candidate particulate material to the matrix based upon the relationship of: A) at least one performance property of the composition, and either of B) 1) the at least one homogeneous interaction parameter for each candidate particulate material, or B) 2) the at least one homogeneous interaction parameter for each candidate particulate material and at least one heterogeneous interaction parameter for each candidate particulate material and the matrix. Therefore, for the adding recitation of claim 1, the addition of the particulate material to the matrix is based upon the relationship of at least one performance property of the composition and *at least* one homogeneous interaction parameter for each candidate particulate material for either alternative B) 1) or B) 2).

Cuch et al. also fails to teach or suggest the adding recitation of claim 1 on appeal. As indicated, the black wicking rating of Cuch et al. relates to *a performance property* of the coated paper, and Cuch et al. does not separately provide a measure of a homogeneous interaction parameter for any particulate material itself of the ink jet coating composition, nor a heterogeneous interaction parameter for a particulate material and the matrix. As also recited in claim 1 on appeal, *the*

relationship of at least one homogeneous interaction parameter of the candidate particulate material and a performance property of the composition is taken into account for adding the particulate material to a matrix. As indicated, the black wicking rating of Cuch et al. is not a homogeneous interaction parameter of a particulate material, nor could it be that property *and* also have a *relationship* with itself as a performance property of the composition. Cuch et al. cannot be read to cover the combination and inter-relationship of all these different recitations recited in claim 1 on appeal. Therefore, Cuch et al. also differs from claim 1 by failing to teach or suggest the adding recitation thereof.

Therefore, in view of at least the above differences that exist between Cuch et al. and claim 1 on appeal, it is apparent that Cuch et al. fails to expressly or inherently identically disclose claim 1. In view of these differences, it also is apparent that the instant claim language is <u>not</u> sufficiently broad to have been properly read on Cuch et al., as alleged in the Final Office Action (page 5). In the absence of an identical disclosure to present claim 1, Cuch et al. cannot anticipate the claim. Further, the Final Office Action has not indicated that claim 1 on appeal is obvious over Cuch et al., and, even if such an assertion is made, the above-identified significant differences between Cuch et al. and claim 1 would <u>not</u> have been suggested by Cuch et al.

Claims 2-5, 9-11, 13-29, 31-34, 56-58, 60, and 135 recite further features of the method of claim 1 and any intervening claims, and thus are not anticipated by Cuch et al. for at least the same reasons as explained with respect to claim 1.

In view of the above reasons, this rejection of claims 1-5, 9-11, 13-29, 31-34, 56-58, 60, and 135 should be reversed.

The Final Office Action did not separately and individually address any of claims 2-5, 9-11, 13-29, 31-34, 56-58, 60, or 135 grouped with claim 1 under this rejection. As indicated, each

of these claims differ from Cuch et al. for at least the same above-discussed reasons applicable to claim 1. Additional patentable differences between these claims and Cuch et al. are discussed below.

Claim 2

Claim 2, which depends from claim 1, further recites that the homogeneous interaction parameter comprises at least one *interfacial potential property value* or derived value, component or combinations thereof and that the particulate material is measured with respect to physical phenomena that responds to interfacial potential property after effects of morphology have been removed.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 2. Additional reasons for reversal are as follows.

Cuch et al., unlike claim 2 on appeal, only describes implementing a different type of quality control for compositions that comprise a particulate material, which as indicated, is conducted at the product level, which can be problematic. More particularly, the "Black Wicking Rating" (BWR) described in Cuch et al. does not permit the measurement of the particulate material with respect to physical phenomena that responds to interfacial potential property *after effects of morphology have been removed.* As indicated, Cuch et al. is focused in part on evaluating end products to observe which combinations of binders and silica pore volumes and particle sizes appear to provide with desirable product performance. As shown in the Examples of the present application, particulate samples that are the same grade from the standpoint of morphology can have a different interfacial potential property value as defined in the present application, which can lead to inconsistent and/or unpredictable results in products incorporating them. By removing the effects of morphology in measuring a particulate material with respect to physical phenomena that

responds to interfacial potential property, as in the method of present claim 2, the present method avoids or minimizes the incidence of seemingly "in-spec" particulate materials from a morphological standpoint that perform unpredictably from a performance standpoint in a matrix or composition. The method of Cuch et al. would not measure an interfacial potential property value of a homogeneous interaction parameter of the silica or other particulate material contained in the ink jet coating composition. The Examiner has not provided evidence or scientific reasoning on how the black wicking rating or other method disclosed by Cuch et al. is within the scope of claim 2 on appeal, and therefore has not made out a case of express or inherent anticipation by Cuch et al..

Therefore, claim 2 on appeal is not anticipated by and is not obvious over Cuch et al.

In view of the above reasons, the rejection of claim 2 should be reversed.

Claim 3

Claim 3, which depends from claim 1, further recites the heterogeneous interaction parameter comprises at least one interfacial potential property value or derived value, component or combinations thereof for the particulate material and the matrix, wherein the particulate material or matrix are measured with respect to physical phenomena that responds to morphology as well as an interfacial potential property of the particulate material or matrix.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 3. Additional reasons for reversal are as follows.

As defined in the present application, the "interfacial potential" of a particulate material is defined through a measure of a physical phenomenon that depends on the interaction of particulate material with other materials or with itself, *after the effects of morphology have been removed* (e.g., ¶[0043]: page 19, lines 7-9; ¶[0051]: page 22, lines 6-9). The "Black Wicking Rating"

(BWR) described in Cuch et al. does not permit the measurement of a heterogeneous interaction parameter that comprises at least one interfacial potential property value or derived value, component or combinations thereof for the particulate material and the matrix. As indicated, the black wicking rating of Cuch et al. does not relate to the measurement of a physical phenomenon that depends on the interaction of particulate material with other materials in the composition or with itself, *after the effects of morphology have been removed.* Therefore, claim 3 on appeal recites a unique and fundamentally different method than Cuch et al.'s teachings. Again, as shown in the Examples of the present application, particulate materials that appear to have identical morphological properties can behave in different and unpredictable manners relative to each other in a matrix or composition. By removing the effects of morphology by measuring a heterogeneous interaction parameter comprising at least one interfacial potential property value, as in the method of present claim 3, the present method avoids or minimizes the incidence of seemingly "in-spec" particulate materials from a morphological standpoint that perform unpredictably from a performance standpoint in a matrix or composition.

Therefore, claim 3 on appeal is not anticipated by and is not obvious over Cuch et al.

In view of the above reasons, the rejection of claim 3 should be reversed.

Claim 4

Claim 4, which depends from claim 1, further specifies that the selected candidate particulate material has an interfacial potential property value or derived value, component or combinations thereof which results in a target value for the performance property of the composition, wherein the target value is at least one measure of phenomena selected from the group consisting of one or more of interfacial potential by wicking rates (the elected species), or other listed techniques.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 4. Additional reasons for reversal are as follows.

Cuch et al. does not teach or suggest that the "Black Wicking Rating" or BWR relates to measuring a homogeneous interaction parameter of the silicas component of the ink jet coating composition, or a heterogeneous interaction parameter of the silicas component and the matrix, that results in a target value for the performance property of the ink jet coating composition. Again, the wicking rating of Cuch et al. relates to printing on paper that contains the ink jet coating composition of Cuch et al. to determine the wicking of black ink that is printed on the coated paper. Therefore, Cuch et al. provides no evidence of measuring a wicking rate of the particulate material (i.e., silicas) by itself for this reason.

In view of the above reasons, the rejection of claim 4 should be reversed.

Claim 16

Claim 16, which depends from claim 3, further specifies that the interfacial potential property value, or derived value or component or combinations thereof, for the particulate material and/or the matrix are determined by a wicking rate method comprising comparing the wicking rate of two or more different liquids in a particulate packed column.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 16. Additional reasons for reversal are as follows.

As indicated, present claim 16 recites in part that the interfacial potential property value parameters for the particulate material are determined by a wicking rate method comprising comparing the wicking rate of two or more different liquids in a particulate packed column. Clearly, Cuch et al. does not provide such a wicking rate determination with respect to the silicas to be used in the ink jet coating composition. As indicated, Cuch et al. instead relates to a "Black

Wicking Rating" related to the printing performance of the overall ink jet coating composition, and not a comparison of the wicking rate of two or more different liquids in a column packed with the silica particulate. Cuch et al. does not identically disclose claim 16 on appeal. Therefore, claim 16 is not anticipated by Cuch et al.

In view of the above reasons, the rejection of claim 16 should be reversed.

Claim 25

Claim 25, which depends from claim 1, further specifies that the performance property is conductivity, dispersibility, impact strength, color, reinforcement, powder flow, tribocharging, and rheology.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 25. Additional reasons for reversal are as follows.

As indicated, Cuch et al. relates to a "Black Wicking Rating" related to the printing performance of the overall ink jet coating composition, and not a performance property that is conductivity, dispersibility, impact strength, color, reinforcement, powder flow, tribocharging, or rheology. Further, the Examiner has not pointed to some concrete evidence in the record in support of his general finding that claim 25 is rejected and unpatentable to satisfy the substantial evidence test. *In re Zurko*, 258 F.3d 1379, 1385, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001).

Therefore, claim 25 is not anticipated by Cuch et al. The Examiner's generic rejection of claim 25 made without reference to some concrete evidence being relied on in making the rejection should be reversed.

Claim 29

Claim 29, which depends from claim 3, further recites the step of determining the interfacial potential property value, or a derived value, component, or thereof for the matrix,

comprises determining the performance property of a composition comprising the matrix and at least one probe particulate material having a predetermined interfacial potential property value, or derived value or component or combinations thereof, wherein the performance property is selected from the group consisting of molecular weight, molar volume, dipole moment, relative permittivity, viscosity, density, surface tension, melting point, glass transition temperature, color, and UV absorption.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 29. Additional reasons for reversal are as follows.

The Examiner stated in the Final Office Action (page 3) that polyvinyl alcohol/cationic resin of the ink jet coating composition of Cuch et al. has been read on the claimed "matrix," and, as indicated, alternatively suggested in the Final Office Action (page 5) that the paper of Cuch et al. was the matrix. Claim 29 on appeal requires, *inter alia*, <u>determining</u> the interfacial potential property value, or a derived value, component, or thereof <u>for the matrix</u>. Cuch et al. do not provide such a determination with respect to the polyvinyl alcohol/cationic resin itself, nor the paper itself. Instead, as indicated, Cuch relates to a "Black Wicking Rating" related to the printing performance of the overall ink jet coating composition, not the individual constituents of silicas or binder. Further, Cuch et al. does not determine any one of the performance properties specified in claim 29 of a composition containing the matrix. Therefore, claim 29 is not anticipated by Cuch et al.

In view of the above reasons, the rejection of claim 29 should be reversed.

<u>Claim 31</u>

Dependent claim 31, which depends from claim 3, further specifies that the <u>matrix</u> has a <u>predetermined</u> interfacial potential property value, derived value or component or combinations thereof, as derived from one or more of Hildebrand parameters, hydrogen bonding characteristics,

electrostatic factors, fractional polarity, Hansen solubility parameters, Snyder's Polarity index, or solvatochromic parameters.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 31. Additional reasons for reversal are as follows.

As indicated, the Examiner reads the polyvinyl alcohol/cationic resin of the ink jet coating composition, or possibly alternatively the paper, of Cuch et al. on the claimed "matrix." However, Cuch et al. do not provide that polyvinyl alcohol/cationic resin, nor the paper, is a "matrix" that has a predetermined interfacial potential property value, derived value or component or combinations thereof, nor such a value for the binder of Cuch et al. as derived from one or more of Hildebrand parameters, hydrogen bonding characteristics, electrostatic factors, fractional polarity, Hansen solubility parameters, Snyder's Polarity index, or solvatochromic parameters. Cuch et al. does not identically disclose claim 31, and, therefore, cannot anticipate the claim.

In view of the above reasons, the rejection of claim 31 should be reversed.

Claim 32

Claim 32, which depends on claim 3, further specifies the step of determining a surrogate matrix having a predetermined interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof, wherein the surrogate matrix comprises a chemically related formulation of a customer's exact formulation.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 32. Additional reasons for reversal are as follows.

As indicated, the Examiner reads the polyvinyl alcohol/cationic resin of the ink jet coating composition, or possibly alternatively the paper, of Cuch et al. on the claimed "matrix." However,

as indicated, Cuch et al. do not provide that polyvinyl alcohol/cationic resin, nor the paper, is a "matrix" that has a predetermined interfacial potential property value, derived value or component or combinations thereof, nor that the binder or paper of Cuch et al. comprises a chemically related formulation of a customer's exact formulation. Cuch et al. does not identically disclose claim 32, and, therefore, cannot anticipate the claim.

In view of the above reasons, the rejection of claim 32 should be reversed.

Claim 33

Claim 33, which depends from claim 32, further specifies that the step of selecting the candidate particulate material is based on a predetermined relationship between A) at least one performance property of a composition comprising the surrogate matrix and the particulate material, and B) a combination of i) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material and ii) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the surrogate matrix.

The reasons for reversal as discussed above with respect to the rejection of parent claim 1 based on Cuch et al. apply equally to claim 33. Additional reasons for reversal are as follows.

The Examiner did not separately address claim 33 in the Final Office Action. The Examiner has not pointed to some concrete evidence in the record in support of finding that claim 33 is rejected and unpatentable to satisfy the substantial evidence test. *In re Zurko*, 258 F.3d 1379, 1385, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001). Cuch et al. does not teach or suggest a method having the combination of recitations of claim 33 on appeal.

Therefore, claim 33 is not anticipated by Cuch et al. The Examiner's generic rejection of claim 33 made without reference to some concrete evidence being relied on in making the rejection should be reversed.

Claim 56

Independent claim 56 recites a method of forming a composition comprising a candidate particulate material and a matrix, comprising *providing* one or more candidate particulate material selected from carbon black or silica for the matrix, and *determining* a relationship by A) *measuring at least one performance property of the composition*, and B) either *measuring* 1) at least one homogeneous interaction parameter for the particulate material, or 2) at least one homogeneous interaction parameter for the particulate material and at least one heterogeneous interaction parameter for the particulate material and the matrix, and *adding* at least one of the candidate particulate material to the matrix based upon the relationship that has an interfacial potential property value, or derived value or component or combinations thereof which results in a target value for the performance property of the composition.

In part B) of claim 56 on appeal, at least one homogeneous interaction parameter for the particulate material is measured by either measuring B) 1) or B) 2) for the candidate material itself and how that particulate material interacts with itself and also measuring at least one performance property of the composition. As indicated in the discussion of claim 1 on appeal, the black wicking rating of Cuch et al. is a wicking rating for the *overall coating material* that contains all of the components, and there is no measurement or understanding of the silica and how that silica interacts by itself with respect to wicking. The black wicking rating of Cuch et al. relates to a performance property and has nothing to do with understanding a particulate material and the homogeneous interaction parameter of the particulate material. Therefore, Cuch et al. differs from claim 56 at

least by failing to teach or suggest a method of measuring at least one homogeneous interaction parameter for the particulate material.

Also, as indicated in the discussion of claim 4 on appeal, and equally applicable to claim 56, Cuch et al. does not teach or suggest that the black wicking rating relates to measuring a homogeneous interaction parameter of the silica component of the ink jet coating composition that results in a target value for the performance property of the ink jet coating composition. Again, the black wicking rating of Cuch et al. relates to printing on paper that contains the ink jet coating composition of Cuch et al. to determine the wicking of black ink that is printed on the coated paper. Therefore, Cuch et al. provides no evidence of a separate understanding or measurement of a wicking rate or other interfacial potential property value measurement technique for the particulate material (i.e., silica) by itself, contrary to the position taken by the Examiner.

Therefore, in view of at least the above differences that exist between Cuch et al. and present claim 56, it is apparent that Cuch et al. fails to expressly or inherently identically disclose claim 56. In the absence of an identical disclosure to present claim 56, Cuch et al. can not anticipate the claim. Further, the Final Office Action has not indicated that present claim 56 is obvious over Cuch et al., and, even if such an assertion is made, the above-identified significant differences between Cuch et al. and claim 56 would not have been suggested by Cuch et al.

Claims 57, 58, and 60 recite further features of the method of claim 56 and any intervening claims, and thus are not anticipated by Cuch et al. for at least the same reasons as explained with respect to claim 56.

In view of the above reasons, the rejection of claims 56, 57, 58, and 60 should be reversed.

3. Rejection of Claim 7 Under 35 U.S.C. § 103(a) as obvious in view of Cuch et al. (U.S. Patent No. 6,482,883) and Sampei (U.S. Patent No. 7,021,213)

Claim 7

At page 4 of the Final Office Action, claim 7 was finally rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,482,883 to Cuch et al. in view of U.S. Pat No. 7,021,213 to Sampei.

The Examiner's Position

The Examiner relies on Sampei to assert that ink compositions can contain carbon black and silica. Otherwise, the Examiner relies on Cuch et al. to reject the claims in the same manner as set forth above in the §102 rejection.

The Appellants' Position

U.S. Pat No. 7,021,213 to Sampei on its face has an effective filing date in the United States of July 6, 2004, and was published on January 20, 2005 as U.S. Pat. Appln. Publ. No. 2005/0011384 A1. The present application on appeal has a regular filing date in the United States of September 26, 2003, which antedates the effective U.S. filing date of July 6, 2004 of the Sampei patent. The indicated foreign priority date under 35 U.S.C. §119(a)-(d), or (f) of July 15, 2003 of the Sampei reference cannot be used to antedate the present application filing date. *In re Hilmer*, 359 F.2d 859, 149 USPQ 480 (CCPA 1966). Further, the present applicants have claimed the benefit of priority under 35 U.S.C. §119(e) in the present application of their earlier filed U.S. Provisional Application Nos. 60/491,632, filed July 31, 2003; 60/485,965, filed July 10, 2003; 60/485,964, filed July 10, 2003; and 60/459,230, filed April 1, 2003; and 60/497,592, filed August 25, 2003, which collectively support present claim 7 on appeal, and which further antedate the indicated effective U.S. filing date of July 6, 2004 of Sampei.

Even assuming for sake of argument Sampei was available as prior art against the present application, which it is not, the reference does not compensate for the indicated deficiencies of

Cuch et al. For the reasons set forth above, Cuch et al., alone or in combination with Sampei, does not teach or suggest the claimed invention. As indicated, "the measuring ... of at least one homogeneous interaction parameter for at least one candidate particulate material" as recited in claim 1 on appeal is quite different from the "Black Wicking Rating" described in Cuch et al. Again, the black wicking rating of Cuch et al. relates to printing on paper that contains the ink jet coating of Cuch et al. to determine the wicking of the ink that is printed on the coated paper and, therefore, there is no separate understanding or measuring of a wicking rate of the particulate material <u>by itself</u>, contrary to the position taken by the Examiner. Therefore, the instant claims are <u>not</u> broad enough to have been properly read on Cuch et al., as alleged in the Final Office Action (page 5).

Sampei does not teach or suggest the numerous deficiencies mentioned above with respect to Cuch et al. Therefore, even if Sampei is combinable with Cuch et al., for sake of argument only, the combination does not teach or suggest the claimed invention, nor would the cited combination yield predictable results. With regard to the Examiner's assertion that it would be obvious to combine Cuch et al. with Sampei, the appellants submit that the Examiner's position in this matter is flawed. The Examiner appears to have misunderstood the alleged teachings of Cuch et al. In particular, as stated above, Cuch et al. relates to an inkjet <u>coating</u> composition that contains silicas and other ingredients and this composition is <u>coated onto a piece of paper</u>. It is not an <u>ink</u> (or a printing plate) in Cuch et al. (see, e.g., column 3, lines 28-33), which clearly describes a recording material that contains the composition of Cuch et al. One of ordinary skill in the art would not put a black pigment, like carbon black, in an ink receptive layer, since this would destroy the substrate of the paper for printing. One does not print on a black sheet of paper. "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d

900, 221 USPQ 1125 (Fed. Cir. 1984)...", as explained at M.P.E.P. §2143.01 V. As indicated, the Examiner's proposed inclusion of the carbon black of Sampei in the ink composition of Cuch et al. would render the ink composition of Cuch et al. unsatisfactory for its intended purpose.

Further, the Examiner's alleged substitution with Sampei with the use of carbon black in the composition of Cuch et al. would not obtain "predictable results" and further, ink pigment particulates are not a "known element" to be used in ink <u>receptive layers</u>, especially the ink receptive layers of Cuch et al. Therefore, there is no suggestion, motivation, or credible technical reason given by the Examiner for the combination of references relied upon by the Examiner in making this rejection.

As indicated, an aspect of the present inventors'-appellants' invention is their "discovery of the source of a problem" with respect to the lack of appreciation by prior investigators, such as Cuch et al., of the affect that a homogeneous interaction parameter of a particulate material and/or heterogeneous interaction parameters for the particulate material and a matrix can have on product performance of compositions. This discovery of the present appellants' should be considered as part of the "subject matter as a whole" of the present invention, which should be considered in determining the obviousness of an invention under 35 U.S.C. § 103. *In re Sponnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). As indicated, Cuch et al. conducts quality control only at the ink jet coating composition level with the BWR test relating to the black text printing performance of the ink jet recording material using a white background (see, e.g., col. 9, lines 27-54). Therefore, the BWR performance testing of Cuch et al. would <u>not</u> involve a similar solution to the problem addressed in the present method.

For these reasons, the Examiner has not made out a prima facie case that the claimed method of claim 7 on appeal would have been obvious based on the teachings of Cuch et al. and Sampei et al.

In view of the above reasons, this rejection of claim 7 should be reversed.

Conclusion

For the reasons set forth above, the appellants submit that the claims presently pending in the above-captioned application meet all of the requirements of patentability. It is therefore respectfully requested that the Honorable Board reverse the Examiner and remand this application for issue.

Respectfully submitted,

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(10) Claims Appendix

1. A method of forming a composition comprising a candidate particulate material and a matrix, wherein the method comprises

providing one or more candidate particulate material selected from carbon black or silica for said matrix;

measuring (a) at least one homogenous interaction parameter for at least one candidate particulate material, wherein said homogeneous interaction parameter relates to how the candidate particulate material interacts with itself, and/or (b) at least one heterogeneous interaction parameter for at least one candidate particulate material and the matrix, wherein said heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other;

adding at least one of said candidate particulate material to said matrix based upon the relationship of:

A) at least one performance property of the composition and

B) 1) said at least one homogeneous interaction parameter for each candidate particulate material, or

B) 2) said at least one homogeneous interaction parameter for each candidate particulate material and at least one heterogeneous interaction parameter for each candidate particulate material and the matrix.

2. The method of claim 1, wherein the homogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential

property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material, wherein the particulate material being measured with respect to physical phenomena that responds to interfacial potential property after effects of morphology have been removed.

3. The method of claim 2, wherein the heterogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material and for the matrix, wherein the particulate material or matrix are measured with respect to physical phenomena that responds to morphology as well as an interfacial potential property of said particulate material or matrix.

4. The method of claim 1, wherein the selected candidate particulate material has an interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof which results in a target value for the performance property of the composition, wherein the target value is at least one measure of phenomena selected from the group consisting of one or more of interfacial potential by masstone, interfacial potential by gas adsorption techniques, interfacial potential from adsorption from solution, interfacial potential from light scattering or disc centrifuge, interfacial potential by oil absorption, interfacial potential by wicking rates, interfacial potential by rheological tests, interfacial potential by sedimentation volumes, interfacial potential by phase segregations, interfacial potential by inverse gas chromatography, interfacial potential by spreading pressure, interfacial potential by drop contact angle, interfacial potential by measuring the pressure

of gas to remove a probe liquid from the pores of a packed bed of the particulate material after it has been filled or partly filled by the liquid, interfacial potential by measuring the centrifugal force necessary to immerse particles of the particulate material floating on a probe liquid, interfacial potential by measuring the two-dimensional pressure sufficient to force particles of the particulate material floating on a probe liquid in a Langmuir trough, interfacial potential by measuring the relative adsorption of dye probes, interfacial potential by measuring the heat when the particulate material is immersed into a probe liquid, interfacial potential by measuring the heat released when a test adsorbate is adsorbed by the particulate material, and interfacial potential by measuring the sediment volumes in an homologous series of test liquids.

5. The method of claim 1, further comprising the step of determining the relationship between A) and B): comprising obtaining at least one trend and/or functional relationship between A) at least one performance property of two or more compositions, each of said compositions comprising the matrix and a particulate material, and B) 1) at least one homogeneous interaction parameter for the particulate material or B) 2) at least one homogeneous interaction parameter for the particulate material and at least one heterogeneous interaction parameter for the particulate material and the matrix.

7. The method of claim 1, wherein the particulate material is carbon black.

9. The method of claim 1, wherein the particulate material is fumed silica.

10. The method of claim 1, wherein the matrix comprises at least one polymer, solvent,

colorant, surfactant, different particulate material, or combinations thereof.

11. The method of claim 1, wherein the matrix is a polymer.

13. The method of claim 3, wherein the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by a liquid absorptometry method.

14. The method of claim 13, wherein the absorptometry method uses a liquid other than DBP or paraffin oil.

15. The method of claim 14, wherein the absorptometry method uses propylene carbonate, water, ethylene glycol, or mixtures thereof.

16. The method of claim 3, wherein the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by a wicking rate method comprising comparing the wicking rate of two or more different liquids in a particulate packed column.

17. The method of claim 16, wherein the wicking rate method uses nonane, hexadecane, isoalkanes, ethylene glycol, formamide, bromonaphthalene, acetonitrile, benzaldehyde, propylene

carbonate, aniline, cyclohexanol, nitroanisole, dichlorobenzene, water, or mixtures thereof.

18. The method of claim 3, wherein the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by a yield point method comprising measuring a degree of flocculation of the particulate material.

19. The method of claim 18, wherein the yield point method uses a hydrocarbon.

20. The method of claim 19, wherein the hydrocarbon is paraffin oil, hexadecane, nonane, or mixtures thereof.

21. The method of claim 3, wherein the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by a interfacial potential vapor adsorption method comprising using an inert gas for gas adsorption analysis.

22. The method of claim 21, wherein the interfacial potential vapor adsorption method uses pentane, nonane, acetonitrile, methylene chloride, water, or mixtures thereof.

23. The method of claim 3, wherein the interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof for the particulate material and/or the matrix are determined by an IGC

method comprising measuring retention time of a gas probe flowing through a packed bed of particulate material.

24. The method of claim 23, wherein the IGC method uses butane, pentane, hexane, heptane, tetrahydrofuran, acetone, ethyl acetate, ether, chloroform, acetonitrile, or mixtures thereof.

25. The method of claim 1, wherein the performance property is conductivity, dispersibility, impact strength, color, reinforcement, powder flow, tribocharging, and rheology.

26. The method of claim 1, wherein the relationship is the difference between the work of cohesion for the particulate material and the work of adhesion for the particulate material and the matrix.

27. The method of claim 1, wherein the method further comprises the step of selecting the candidate particulate material based on at least one morphological value of the particulate material selected from the group consisting of shape, size, and structure.

28. The method of claim 1, wherein the method further comprises the step of selecting the candidate particulate material based on at least one chemical value of the particulate material selected from at least one of the group consisting of overall composition, surface composition, and extractable materials.

29. The method of claim 3, further comprising the step of determining the interfacial potential

property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof for the matrix, wherein the step of determining the interfacial potential property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof for the matrix comprises determining the performance property of a composition comprising the matrix and at least one probe particulate material having a predetermined interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof, and wherein the performance property is selected from the group consisting of molecular weight, molar volume, dipole moment, relative permittivity, viscosity, density, surface tension, melting point, glass transition temperature, color, and UV absorption.

31. The method of claim 3, wherein the matrix has a predetermined interfacial potential property value, the value derived from an interfacial potential property value, the component of an interfacial potential property value, or combinations thereof, as derived from one or more of Hildebrand parameters, hydrogen bonding characteristics, electrostatic factors, fractional polarity, Hansen solubility parameters, Snyder's Polarity index, or solvatochromic parameters.

32. The method of claim 3, further comprising the step of determining a surrogate matrix having a predetermined interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof, wherein said surrogate matrix comprises a chemically related formulation of a customer's exact formulation.

33. The method of claim 32, further comprising the step of selecting the candidate particulate material based on a predetermined relationship between:

A) at least one performance property of a composition comprising the surrogate matrix and the particulate material, and

B) a combination of

i) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material and

ii) at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the surrogate matrix.

34. The method of claim 33, further comprising the step of determining the relationship between A) and B).

56. A method of forming a composition comprising a candidate particulate material and a matrix, wherein the method comprises providing one or more candidate particulate material selected from carbon black or silica for said matrix and determining a relationship by:

A) measuring at least one performance property of the composition and

B) measuring 1) at least one homogeneous interaction parameter for the particulate material, wherein said homogeneous interaction parameter relates to how the particulate material interacts with itself, or

B) 2) at least one homogeneous interaction parameter for the particulate material and

at least one heterogeneous interaction parameter for the particulate material and the matrix, wherein said heterogeneous interaction parameter relates to how the particulate material and the matrix interact with each other,

adding at least one of said candidate particulate material to said matrix based upon the relationship, wherein the selected candidate matrix has an interfacial potential property value, value derived from an interfacial potential property value, component of an interfacial potential property value, or combinations thereof which results in a target value for the performance property of the composition.

57. The method of claim 56, wherein the homogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material.

58. The method of claim 57, wherein the heterogeneous interaction parameter comprises at least one interfacial potential property value, at least one value derived from an interfacial potential property value, at least one component of an interfacial potential property value, or combinations thereof for the particulate material and for the matrix.

60. The method of claim 56, further comprising the step of determining the relationship between A) and B).

135. The method of claim 2, wherein the particulate material being measured with respect to

physical phenomena that responds both to morphology and interfacial potential property, wherein phenomenon that respond to interfacial potential are assigned an interfacial potential property value to the particulate material where at least one of the following conditions is met selected from the group consisting of:

A) effect of morphology is eliminated by also measuring the physical phenomena with an inert probe wherein an inert probe is one for which the interfacial potential is negligible;

B) an external parameter selected from pressure or temperature is changed and the response to that parameter allows an independent calculation of one or more morphological and interfacial potential values; and

C) the physical phenomenon is measured with the same particulate material in different fluids.

(11) Evidence Appendix

SELECTED (ANNOTATED) TABLES & FIGURES OF APPLICATION

Example 2

¶[0091]: page 40, lines 1-8.

Table 3

Sample name		Volume @Max Torque		
	% of max DBP	EG	60% EG	Water
Plant A	97	77.1	108.8	17.15
Plant B	98.8	71.95	92.9	132.15
Plant C	97.8	72.8	90	138.35
Plant D	95.8	82.3	115.4	145.8
Plant E	100	73.5	91.9	100.35
↑31	**↑32**	**↑33**	**↑34**	**↑35**

Example 3

¶[0093]: page 40, lines 23-29.

Table 4

Sample name		Volume @Max Torque		
	% of max DBP	EG	60% EG	Water
Plant F	100	115.3	150.5	217.1
Plant G	98.3	114.0	141.5	183.95
Plant H	97.2	111.5	138.9	208.2
Plant I	97.5	114.1	139.6	226.75
↑41	**↑42**	**↑43**	**↑44**	**↑45**

Example 4

¶[0095]: page 41, lines 16-29.

Table 5

↓51

Analytical Properties											
I2 Number	71	85.3	88	86.5	88.6	85.7	85.8	85.8	82.2	85.9	87.9
DBPA	108	106.9	108.2	106.5	108.1	104.9	104.4	105.9	104.5	102.9	107.8
N2SA	61.8	75.6	76	75.7	75.7	73.9		76.1	73.6	74.6	77
STSA	61.4	74.7	71.7	72.2	69.6	69.4		72.8	70.3	70.1	71.3
Tint	89.3	105.5	99.2	98	99.3	104	98.1	94.1	98.3	102.9	94.8
Wicking Rates											
Water	0.0005	0.0011	0.0011	0.0007	0.0009	0.0006	0.0007	0.0006	0.0006	0.0009	0.0010
Formamide	0.0044	0.0062	0.0049	0.0039	0.0063	0.0049	0.0054	0.0029	0.0025	0.0045	0.0050
Ethylene Glycol	0.0023	0.0011	0.0012	0.0008	0.0016	0.0011	0.0016	0.0007	0.0004	0.0012	0.0015
Bromonaphthalene	0.0060	0.0023	0.0031	0.0017	0.0021	0.0017	0.0017	0.0017	0.0011	0.0020	0.0020
Pentane	0.0212	0.0046	0.0077	0.0029	0.0074	0.0091	0.0070	0.0038	0.0028	0.0049	0.0085
Tetrahydrofuran	0.0094	0.0055	0.0125	0.0047	0.0185	0.0065	0.0138	0.0062	0.0032	0.0090	0.0136

↑52

<u>Example 5</u>

¶[0102]: page 43, line 29 to page 44, line 5; ¶[0105]: page 45, lines 9-10.

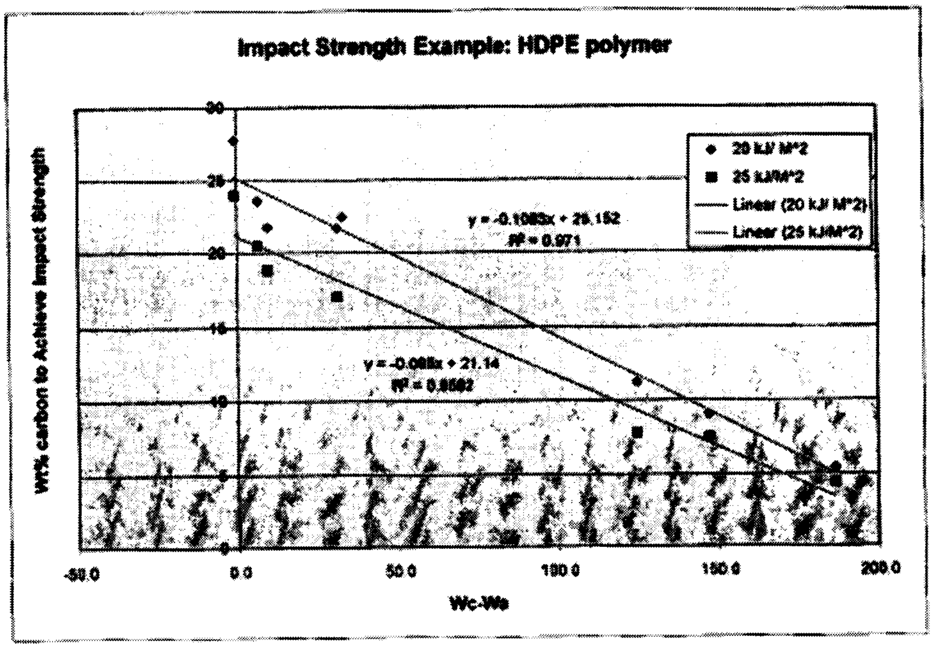


Figure 3. Wc-Wa calculation used to predict the weight percent carbon needed in a HDPE composite to achieve impact resistance of 20kJ/m2 (diamonds) and 25kJ/m2 (squares) for 7 different carbon black particles.

Example 8

¶[0108]: page 47, lines 4-16.

Table 9 - Hansen Solubility Parameters for Liquids

Solvent	S^d	S^p	S^H
Hexadecane	16.3	0	0
Nonane	15.7	0	0
Acetonitrile	15.3	18	6.1
Benzaldehyde	19.4	7.4	5.3
Bromonapthalene	20.3	3.1	4.1
Cyclohexanol	17.4	4.1	13.
o-Dichlorobenzene	19.2	6.3	3.3
Ethylene glycol	17	11	26
Formamide	17.2	26.	19
o-Nitroanisole	19.1	9.4	6.1
Propylene	20	18	4.1

¶[0109]: page 48, lines 1-11.

Table 10

Interfacial Potential Values - Hansen Solubility Parameter Scale

Sample Number	S^d	S^p	S^H
568	159	0.001	173
561	54	1.6	23
560	63	1.8	25
481	109	4.0	109
562	57	0	56
467	128	0.006	97
555	116	1.1	130
502	51	1.1	28
505	78	0.69	47

Example 9

¶[0110]: page 48, lines 18-28.

Table 11 - Hildebrand Parameters for Liquids

Solvent	δ_l
Nonane	15.6
Acetonitrile	24.3
Benzaldehyde	21.1
Bromonapthalene	19.2
Cyclohexanol	21.7
o-Dichlorobenzene	20.5
Ethylene glycol	29.9
Formamide	39.3
Propylene	27.2

¶[0112]: page 49, lines 11-21.

Table 11

Interfacial Potential Values - Hildebrand Parameters

Sample	δ_l
568	341
561	93
560	107
481	248
562	113
467	231
555	244
502	94
505	142

Example 10

¶[0114]: page 50, lines 8-18, page 51, lines 1-12.

Table 12

Interfacial Potential Values -Ab Initio Scale

Sample	S^1	S^2	S^3
568	49.0	175.0	4.7
561	10.4	7.1	8.0
560	12.2	7.8	9.1
481	23.3	22.4	24.9
562	11.1	12.7	8.4
467	25.9	22.6	14.9
555	24.1	136.2	16.1
502	10.2	7.0	7.7
505	16.1	12.4	11.5

Table 13

Solvent	S^1	S^2	S^3
Hexadecane	27.1	0.0	0.0
Nonane	22.4	0.0	0.0
Acetonitrile	1.0	0.0	27.2
Benzaldehyde	4.4	0.0	34.8
Bromonapthalene	3.5	0.3	40.8
Cyclohexanol	4.5	29.5	0.0
Ethylene Glycol	4.5	23.7	19.8
Formamide	49.3	3.1	5.8
o-Nitroanisole	4.5	1.9	39.6
Propylene	39.0	1.4	1.0

Example 11

¶[0116]: page 51, lines 20-29.

Table 14

Condition	CB-6A	CB-6B	CB-6C
Burner Air Rate (nm^3/h)	5976	5976	5976
Burner Gas Rate (nm^3/h)	305	305	305
Feedstock Rate to Reactor (kg/h)	2209	2225	2207
Tangential Air to Reactor (nm^3/h)	724	724	724
Air Preheat (^oC)	510	510	510
Feedstock Preheat (^oC)	173	173	173
K^+ concentration in feedstock (gm/1000 kg)	8.1	7.5	2.8
Reactor Quench Length (ft)	17	22.5	33.5

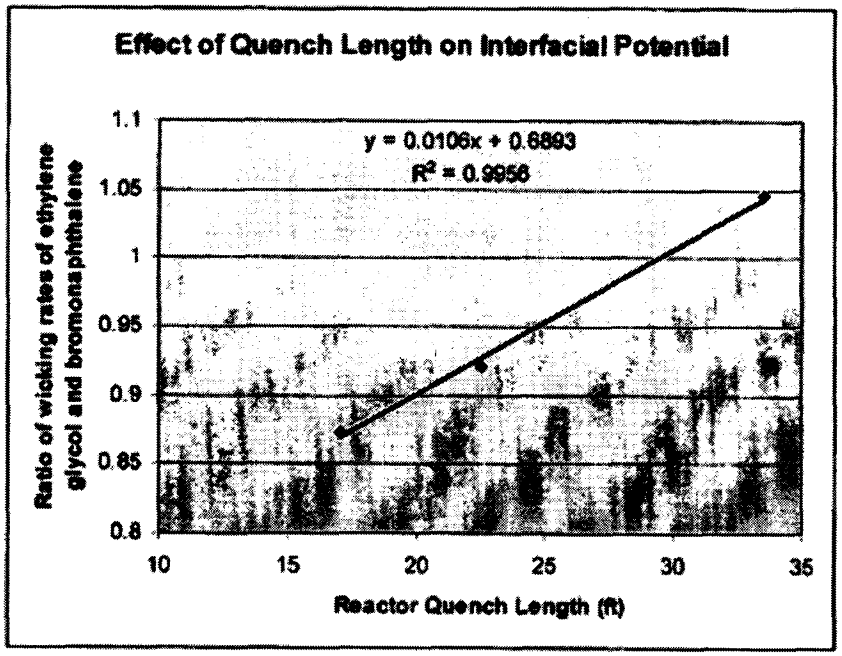
¶[0117]: page 52, lines 8-14.

Table 15

Properties	CB-6A	CB-6B	CB-6C
Fluffy Black N_2 surface area (m^2/gm)	76	74	76
Fluffy Black DBPA (cc/100 gm)	107	107	108
Ethylene Glycol	0.00142	0.00119	0.00150
Bromonaphthlalene	0.00162	0.00129	0.00143
Ethylene glycol/Bromonaphthalene	0.874	0.921	1.046

¶[0119]: page 52, line 19-21.

Figure 5



Example 12

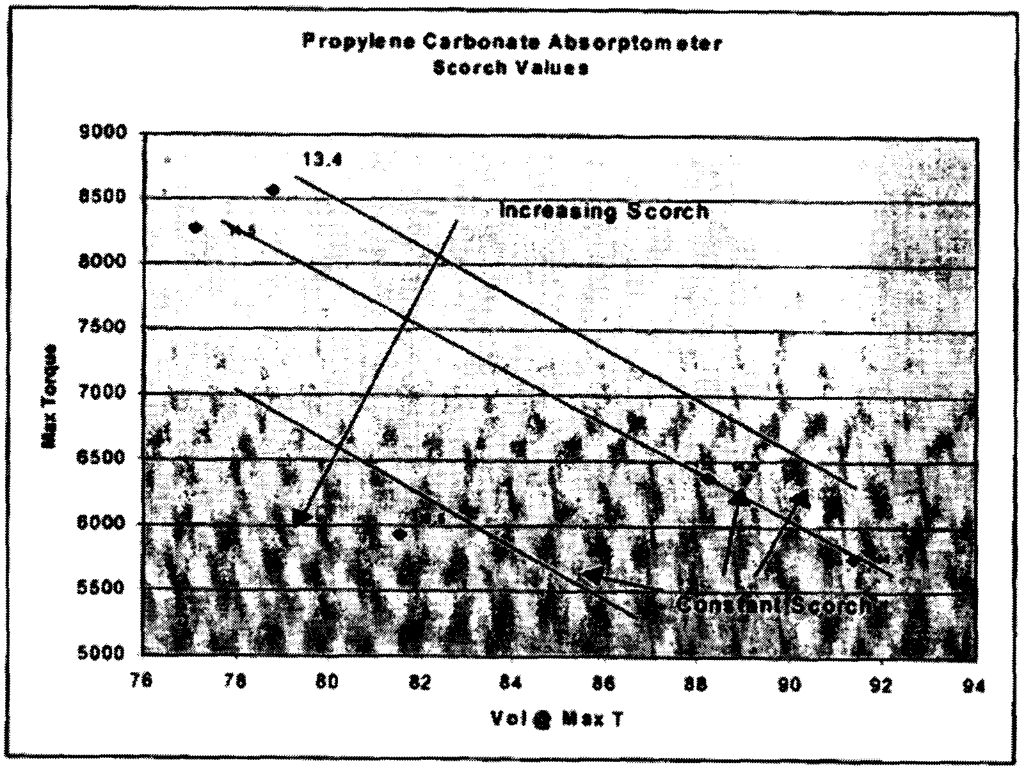
¶[0121]: page 53, lines 7-15.

Table 16

ID	SBR Scorch T5	Iodine Number (mg/g)	DBP (cc/100g) @70%	BET Surface Area (m2/g)	STSA (m2/g)	Median Aggregate Size (nm) by DCP	Delta D50 Aggregate Size (nm) by DCP	Vol at Max T Propylene Carbonate	Max T Propylene Carbonate
CB-1	14.8	84	74	77	76	87	62	88.2	6372.5
CB-2	13.4	80	75	77	76	86	64	78.75	8561
CB-3	14.5	80	75	75	75	85	57	77.1	8264.5
CB-4	14.1	80	74	74	73	90	66	91.35	5759.5
CB-5	16.5	77	75	74	73	91	71	81.55	5931.5

¶[0122]: page 53, line 16-19:

Figure 6



(12) Related Proceedings Appendix

None.